REMARKS

This paper is filed in response to the Office Action mailed on January 3, 2008. Presently, Claims 1, 3-15, and 22-24 are pending in the application. Claims 25 and 26 have been added. Claims 1, 3-15, and 22-24 have been examined and stand rejected. Accordingly, reconsideration of Claims 1, 3-15, and 22-24 and consideration of Claims 25 and 26 are respectfully requested.

The Rejection of Claims 1, 3-15, and 22-24 Under 35 U.S.C. § 103(a)

Claims 1, 3-15, and 22-24 are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 4,943,516 (Kamayachi et al.) as supported with U.S. Patent No. 5,837,355 (Hayai) in view of U.S. Patent No. 5,626,774 (Paulus), and further in view of applicants' admitted prior art (AAPA).

Claims 1, 3, 4, 6, 7, 9, 13, 15, and 22 are the independent claims and all have in common that a thermosetting film is applied which becomes the outermost surface, and a laser beam is used to selectively remove the film to expose circuit patterns to be brazed and leaves the thermosetting film as a solder resist mask over areas other than the circuit patterns to be brazed. Therefore, the claims describe the use of a laser for a *subtractive* process where the solder resist mask is created by subtracting or removing material via the laser. In the claimed invention, the laser is applied to areas where the mask is *removed* to expose the circuit patterns to be brazed and leaves the mask over areas other than the circuit patterns to be brazed. Furthermore, the claims also have in common that the thermosetting film when applied is the outermost surface. As explained in the specification beginning at page 26, line 18, the claimed invention can replace the conventional solder resist printing processes and results in reducing the time required for fabricating printed circuit boards. This is possible because of the recent appearance of high performance lasers with sufficient accuracy.

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In the invention of Kamayachi et al., the objective is to provide a photo-sensitive thermosetting resin composition that excels in both developing properties and sensitivity. (See Kamayachi et al., Col. 3, lines 25-30.) The photo-sensitive thermosetting resin composition comprises: a photo-sensitive prepolymer containing at least two ethylenically unsaturated bonds in the molecular unit thereof, a photo initiator, a photo-polymerizable vinyl monomer and/or an organic solvent as a diluent, and a finely powdered epoxy compound containing at least two epoxy groups and the molecular unit thereof an exhibiting sparing solubility in the diluent to be used. (See Kamayachi et al., Col. 3, lines 43-55.) Kamayachi et al. specifically relates to a thermosetting resin composition that polymerizes upon exposure to laser energy. Therefore, Kamayachi et al. teaches the use of a laser in an *additive* process. That is, the laser of Kamayachi et al. is applied to the areas of the mask that *are not removed.* The areas of the mask where the laser is exposed become the areas that protect the areas that are not to be brazed. In the areas where the thermosetting resin is not exposed to laser energy, the thermosetting resin is designed to be dissolved with a suitable solvent to expose the areas to be brazed.

Applicants submit that one of ordinary skill would not have recognized that the technique used in Paulus would have produced the same result in Kamayachi et al. As mentioned above, the resin of Kamayachi et al. is a photo-sensitive resin designed to polymerize and react upon the application of laser energy. Therefore, rather than be ablated by laser energy, it is more likely that the resin of Kamayachi et al. would instead polymerize as it *was designed to do under laser energy.* Furthermore, the Kamayachi et al. process is an *additive* process as opposed to Paulus that is a *subtractive* process. Accordingly, applying a subtractive laser of Paulus in the additive method of Kamayachi et al. would have resulted in exposing the very areas that need to be protected by the mask.

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Furthermore, even if was the intent of the Examiner to suggest replacing the resin of Kamayachi et al. with that of Paulus, Paulus discloses a method of forming a solder-resist pattern by applying a *copper foil coated with thermosetting resin* to the surface of the printed circuit board and leaving the copper foil as the outermost surface. Forming the solder mask, as disclosed by Paulus, requires that the copper foil be etched using a photo-imageable adhesive film followed by photo curing an etch resist mask and dissolving the uncured etch resist and copper with a suitable solvent. Only then, is the underlying epoxy resin 26 removed by means of plasma, UV laser, or IR laser. Afterwards, the remaining copper foil is etched, leaving the fully cured epoxy resin layer as a permanent solder mask on the surface of the printed circuit board.

Applicants' invention eliminates the need to have a copper foil with the thermosetting film during laser ablation because of the higher accuracy of the laser. The Examiner is requested to take note that the claims recite that the thermosetting resin is applied so that it is the outermost surface, unlike Paulus.

Applicants submit that one of ordinary skill could not have arrived at the claimed invention because Kamayachi et al. is an additive process, where laser energy is used in the areas where the solder resist mask is desired, whereas applicants' invention uses the laser in the areas where the solder resist mask is not desired. Second, Paulus discloses that if a laser is to be used to remove resin, the resin is protected with a copper foil. Applicants' invention does not require the need for a copper foil because of the use of high accuracy lasers.

Accordingly, the withdrawal of the rejection is respectfully requested.

The Rejection of Claims 1, 3-15, and 22-24 Under 35 U.S.C. § 103(a)

Claims 1, 3-15, and 22-24 are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,879,568 (Urasaki et al.) in view of Paulus and further in view of applicants' admitted prior art.

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Urasaki et al. discloses the use of lasers to form *via holes 5* in the resin layer 2 leaving behind an upper layer of metal foil 3. See Col. 7, line 54; Col. 9, line 56; Col. 10, line 23. Thus, Urasaki et al. does not even remotely disclose forming a solder resist mask pattern from the resin layer 2. The only teaching in Urasaki et al. of forming a "solder resist" is described in connection with Figure 2. At Col. 10, lines 27-31, Urasaki et al. states "a solder resist 16 was formed and electroless nickel plating was carried out on the bonding pads with a plating solution." However, Urasaki et al. does not state that a laser beam is irradiated to form the solder resist 16. Consequently, while Urasaki et al. may teach the use of laser beams for the removal of resin layer 2 for the purpose of forming via holes 5 in insulators, such disclosure even when combined with Paulus would not have led one of ordinary skill to make the claimed invention.

Accordingly, the withdrawal of the rejection is respectfully requested.

The Rejection of Claims 7, 9, 25 and 26 Under 35 U.S.C. § 103(a)

Claims 7, 9, 25, and 26 relate to an embodiment of the invention, wherein the multilayer printed circuit board is formed in a parallel manner. This fabrication technique is described in the specification with regards to FIGURES 6-9. In the parallel fabrication method, layers having circuits formed thereon are formed independently of insulating layers. The fabrication of the layers with circuit patterns is described with reference to FIGURES 6A-6F. The fabrication of the insulating layers is described with reference to FIGURES 7A-7D. The individual circuit layers and the individual insulating layers are assembled as shown in FIGURE 8. Heat and pressure are applied to join the circuit layers with the insulating layers into a multilayered printed circuit board, as shown in FIGURE 9.

The embodiment that is claimed in Claims 7, 9, 25, and 26 relates to the forming of a solder resist mask using a laser for the outer circuit layer that is not yet assembled into the multilayered printed circuit board. The layer is disclosed in FIGURES 6E and 6F. A single side

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of the layer is provided with the solder resist as shown with regards to numeral 607 in FIGURES 6E and 6F. Therefore, Claims 7, 9, 25, and 26 relate to forming the solder resist mask on an individual circuit layer *before* the printed circuit board is assembled. The disclosure of Paulus beginning at Col. 2, lines 52 to Col. 3, line 11, teaches assembling the circuit layers and insulation layers into the four layer printed circuit board *followed* by the creation of the solder-resist mask. This is evident from the disclosure in Paulus beginning at Col. 3, line 14, through line 43. As is further apparent from FIGURE 1A, Paulus is clearly assembling the printed circuit board 10, *followed* by forming the solder-resist mask in FIGURES 2A, 2B, 3A, and 3B.

Therefore, Paulus does not disclose the sequence of steps recited in Claims 22, 25, and 26.

CONCLUSION

In view of the foregoing amendments and remarks, applicants submit that the application is in condition for allowance. If the Examiner has any further questions or comments, the Examiner may contact the applicants' attorney at the number provided below.

Respectfully submitted,

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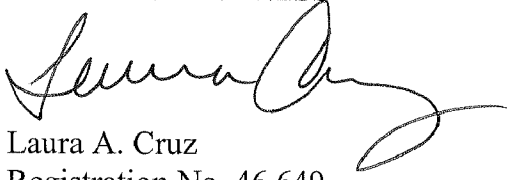

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